

Winter habitat selection of red-crowned crane (*Grus japonensis*)¹

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Abstract This paper studied the winter habitat selection of red-crowned cranes (*Grus japonensis*) in Yancheng National Natural Reserve, Jiangsu Province. There were six types of habitat used by red-crowned cranes, i.e. salt-works, aquiculture ponds, reed lands, grassy tidal lands, salting wormwood lands and wheat fields. The wheat field was a new type of habitat used by red-crowned cranes. More than 70 percent of red-crowned cranes chose grassy tidal lands, salting wormwood lands, and reed lands as their most important habitats. In recent years, the distribution of red-crowned cranes moved southward gradually. Red-crowned cranes prefer artificial or semi-artificial wetlands rather than original wetlands, successive distribution was broken into fragments.

Key words: Red-crowned cranes, Winter habitat, Habitat selection

Introduction

Red-crowned crane (*Grus japonensis*) is a vulnerable species, which is now endangered enough to be listed in the name list of National First-grade Protected Wildlife of China. In recent years with the increasing of people's requirements for resource, the size of habitat used by red-crowned cranes has decreased successively as a result of mankind's excessive exploitation on resource with plundering and blindness. Populations are also threatened seriously. So it is urgent to strengthen protection of habitat used by red-crowned cranes now.

Protection of habitat must be based on thorough studies of habitat. Therefore, habitat, especially that of endangered species draw lots of attention of civil and foreign scholars. Protection of winter habitat used by migratory birds is an important issue of ecology and conservation biology.

At present, there are totally 2 000 individuals of wild red-crowned cranes all over the world. Yancheng Natural Reserve is its largest winter habitat. Annually, 600-800 red-crowned cranes winter here. From 1996 to the spring of 1997, wintering red-crowned cranes in this reserve were recorded for 1 020 (Ma et al. 1998a).

Many studies on red-crowned cranes had been conducted by civil and foreign scholars (Ma et al. 1998b; Li 1986; Feng et al. 1986). But habitat selection in China of red-crowned cranes has not been issued quantitatively.

We carried out studies on the winter habitat of red-crowned cranes in Yancheng National Nature Reserve, Jiangsu Province from October of 1998 to March of 1999.

Study area

Yancheng is situated in the lower reaches of Huai River and on the coast of Huang Sea with the geographical position of $119^{\circ}27' \sim 120^{\circ}56'E$ and $32^{\circ}34' \sim 34^{\circ}38'N$. The marshland with a broad and smooth terrain, belonging to the plain deposited by Yangtze River, Huai River and Huang River, covers $1.54 \times 10^5 \text{ hm}^2$ (Littoral zone). A lot of branching streams are scattered on the beach where there is a large area of salt marshland, reed lands, grassy tidal lands. Main rivers in this area such as Xingang River, Subei irrigation canal, belong to Huai River system, enter sea here.

This area crosses both warm temperate zone and sub-tropical zone. There are clear four seasons and obvious feature of monsoon climate in warm temperate zone. It is under the control of high pressure from Siberia in winter and sub-tropical high pressure from the Pacific Ocean in summer. So it is fine, cold and dry in winter while hot and rainy in summer. The wind is usually towards northwards in winter while southwards in summer. Average temperate is $4700-5200^{\circ}\text{C}$. Annual precipitation is ranged 980-1 070 mm. The frost-free period is 210-244 d.

According to investigation, there are 54 species of plants on beach, belonging to 46 genuses of 15 families. The dominant species are as the following: *Imperata cylindrica*, *Zogzia macrostachys*, *Phragmites Communis*, *Scirpus yagara*, *Saaeda glauca*, *Typhula tifolia*, *Puppia rosteiliaekah*, *Aeluropus lottorios*. There are 581 species of animals, including 220

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species of invertebrates and 361 species of vertebrates. The fauna in inter-tidal zone is mainly made up of *Meretrix meretrix*, *Cylina sinensis*, *Bullacta exarta*, *Oncomelania Parafossarulus*, *Sinonvacua constricta*, *Hemigrapsus penicillatus*, *Hsinensis*, *Perinereis aibuhitensis*, which provides rich food for red-crowned cranes.

Study methods

From October of 1998 to March of 1999, we investigated the activities of red-crowned cranes and set samples in the sites where red-crowned cranes often feed and take other activities. In the samples, we measured a series of ecological factors, 50 sites were defined randomly and analyzed with controlling.

Table 1. Main types of habitats used by red-crowned cranes

Habitat types	Area /km ²	Wetland types	Dominant plants	Dominant animals
Salt-works	325.51	Artificial wetland	--	Wheat
Aquiculture ponds	251.17	Artificial wetland	Reed	Fish and shrimp
Reed lands	107.04	Original, artificial or semi-artificial wetlands	Reed	Crab
Grassy tidal lands	266.01	Original wetlands	<i>Aeluropus lottoralos</i>	Crab
Salting wormwood Lands	139.98	Original, artificial or semi-artificial wetlands	<i>Imperata cylindrica</i>	Crab
Wheat fields	287.32	--	Wheat	--

Salt-works

Salt-works, belonging to artificial wetland, are mainly situated in the north of the reserve. Evaporating salt method, condensing seawater gradually by evaporating brine in the sun and by winding, is common method in salt production. At the primitive phase of condensing water, the water quality, species of living things and biomass are similar to those in the near seawater. There are also of fish, shrimp, spiral shell, shellfish etc.. A common salt field reaches from several hundred acres to one thousand. Red-crowned cranes are mostly seen in the primitive salt-works where there are relatively lower salt contents and higher biomass.

Aquiculture ponds

Aquiculture pond is also called reed and fishpond. Generally fish and shrimp are bred in center, while reed is planted in the shallow water on the margin of the pond.

Reed field

Reed field consists of wild reed community and artificial reed base. The former was mostly distributes in sand mouth and depression where there is plenty of water resource. Artificial reed base is basically similar to original wetland and wild reed communities, but it had a larger area and fewer species.

We studied the winter habitat of red-crowned cranes from December of 1998 to February of 1999. All investigators were divided into two groups to measure defined factors in the habitat including plant species, plant height, plant dispersal, water area, extent of human disturbing, reed area and water depth. At the same time, some random samples were set up and selected coefficients were also calculated.

Results

Main types of habitats of red-crowned cranes

According to types of vegetation and human activities, habitat of red-crowned cranes could be divided into 6 types in Table 1 (Ma et al. 1998a).

Salting wormwood lands

Salting wormwood lands is the pioneer community in the succession of vegetation on the beach. Most of them were distributed in the middle and south of the reserve.

Grassy tidal lands

Grassy tidal land, an important type of original wetland in the reserve, is one of the climaxes in the succession of salting vegetation community on the marshland with dominant plants such as *Imperata cylindrica* etc.. It is rich in plant species and quantities on weed beach. Here main accompanying plants are *Aeluropus lottoralos*, *Zogsia macrostochys* etc..

Wheat fields

Wheat fields are mostly situated in buffer zone of the reserve or transitional region near periphery areas where a few red-crowned cranes feed annually.

Numbers of red-crowned cranes in different habitats

Because the Natural Reserve and local government took some protective measures for red-crowned cranes, the amount of red-crowned cranes is rising steadily all the time (Lu 1988; Ma et al. 1998b). The number of red-crowned cranes maintains about 800 all the time, which makes up half of the total number of red-crowned cranes in the world. In 1996, the win-

tering population was recorded 1 020 individuals, which peaked the record in Natural Reserve (Ma et al.

1998a). The 1998 record is 669. The quantitative changes of wintering population are shown in Fig. 1.

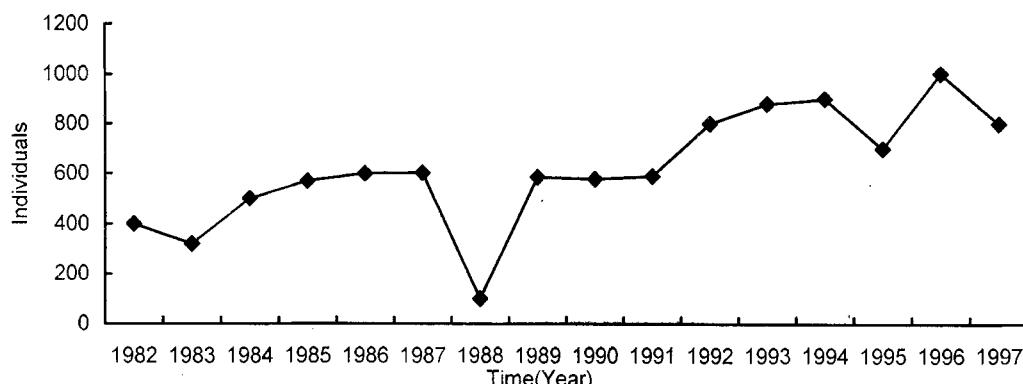


Fig. 1. The quantitative changes of red-crowned cranes wintering in Yancheng National Natural Reserve

There are six types of habitat used by red-crowned cranes, i. e. salt-works, aquiculture ponds, reed lands, grassy tidal lands, salting wormwood lands and wheat fields. Wheat field is a new type of habitat selected by red-crowned cranes (Table 2). More than 70 percent of red-crowned cranes chose grassy tidal lands, salting wormwood lands, and reed lands as their most favorite habitats.

Table 2. Numbers of red-crowned cranes in different habitat types

Habitat types	Individuals
Salt-works	32
Aquiculture ponds	130
Reed lands	52
Grassy tidal lands	38
Salting wormwood Lands	443
Wheat fields	4

Discussion

Beach in Yancheng Natural Reserve had been habitat of red-crowned cranes for a long time (Ma et al. 1998a). During early 1960s, there were 1 500 individuals of red-crowned cranes recorded here. Lots of them were found to halt or feed on the beach in many counties of Yancheng. But the numbers of red-crowned cranes declined annually as a result of enclosing tidal land for cultivation in a large scale and illegal hunting from late 1960s to 1970s. When the Natural Reserve was founded in 1993, there were only 361 red-crowned cranes, scattering on the beach of some counties of Yancheng. In recent years, great changes had taken place in the habitat of red-crowned cranes as follows:

(1) Distributions of red-crowned cranes moved to

the south gradually.

(2) The habitat of red-crowned cranes was transformed from original wetlands to artificial or semi-artificial wetlands.

(3) The successive distribution of red-crowned cranes was broken into isolated fragments.

Red-crowned cranes habitat generally in wetland. Wheat field became a new type of habitat, which wasn't recorded in the census reports on Yancheng Natural Reserve before. This indicated that changes had taken place in the habitat of red-crowned cranes and red-crowned cranes had adaptability for habitat selection. According to the studies on winter habitat of red-crowned cranes, marshland ecosystem was still most suitable for red-crowned cranes to select. More than 70 percent of red-crowned cranes chose grassy tidal lands and salting wormwood lands as their most favorite habitat.

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